

**TITLE:** Modeling the Skills and Practices of Scientists through an “All-Inclusive” Comparative Planetology Student Research Investigation

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To effectively prepare the nation’s future Science, Technology, Engineering, and Mathematics (STEM) workforce, students in today’s classrooms need opportunities to engage in authentic experiences that model skills and practices used by STEM professionals. Relevant, real-world authentic research experiences allow students to behave as scientists as they model the process of science. This enables students to get a true sense of STEM-related professions and also allows them to develop the requisite knowledge, skills, curiosity, and creativity necessary for success in STEM careers. Providing professional development and opportunities to help teachers infuse research in the classroom is one of the primary goals of the Expedition Earth and Beyond (EEAB) program.

EEAB, facilitated by the Astromaterials Research and Exploration Science (ARES) Directorate at the NASA Johnson Space Center, is an Earth and planetary science education program designed to inspire, engage, and educate teachers and students in grades 5-12 by getting them actively involved with exploration, discovery, and the process of science. The program combines the expertise of scientists and educators to ensure the professional development provided to classroom teachers is scientifically valid and also recognizes classroom constraints. For many teachers, facilitating research in the classroom can be challenging. In addition to addressing required academic standards and dealing with time constraints, challenges include structuring a research investigation the entire class can successfully complete. To build educator confidence, foster positive classroom research experiences, and enable teachers to help students model the skills and practices of scientists, EEAB has created an “all-inclusive” comparative planetology research investigation activity. This activity addresses academic standards while recognizing students (and teachers) potentially lack experience with scientific practices involved in conducting research. Designed as an entry level research engagement investigation, the activity introduces, illustrates, and teaches the skills involved in each step of the research process. Students use astronaut photos, provided through the ARES Crew Earth Observations (CEO) payload on the International Space Station (ISS) as well as remote sensing imagery of other planetary worlds. By including all the necessary tools to complete the investigation, students can focus on gaining experience in the process of science. Additionally, students are able to extend their experience of modeling the skills and practices of scientists through the opportunity to request new data of Earth from the ISS.

Professional development offered through in-person and webinar trainings, along with the resources provided, enable educators to gain first-hand experience implementing a structured research investigation in the classroom. Through data and feedback collected from teachers, this type of “all-inclusive” investigation activity aims to become a model that can be utilized for other research topics and STEM disciplines.